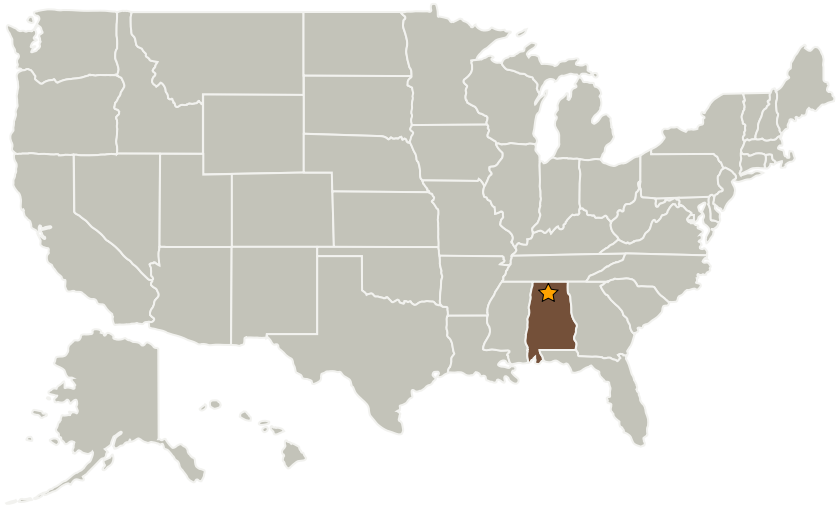
Smart Crucibles for Materials Processing in Microgravity, Phase I

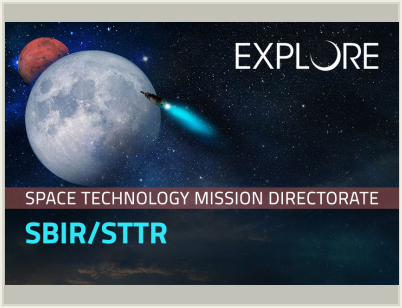
Completed Technology Project (2004 - 2004)

Project Introduction

Crucibles comprised of an internal ceramic liner in direct contact with a metal reinforcement are desired to maximize heat transfer between the sample and the furnace for materials processing experiments in microgravity. Previous work by Plasma Processes Inc. has demonstrated forming techniques to provide reinforced crucibles that survive quenching and produce samples with enhanced microstructural features compared to samples processed in conventional ampoule/cartridge assemblies. However, incorporation of thermocouples has been limited to either inside the crucible cavity or on the external surface of the metal reinforcement. The science requirements of several NASA principle investigators prevent the placement of thermocouples in these locations. In addition, a failure detection technique based on the use of krypton gas is required on some microgravity furnaces. Therefore, ?smart? crucibles are needed that incorporate thermocouple grooves and a reservoir for krypton gas storage within the crucible wall. Because of intimate contact between all the layers of the ?smart? crucible, optimum heat transfer rates are maintained.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Plasma Processes, LLC	Supporting Organization	Industry Veteran-Owned Small Business (VOSB)	Huntsville, Alabama

Primary U.S. Work Locations
Alabama

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Scott O'dell

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.6 Repurpose Processes